

Axis and Rusa, ultimately culminating in the wonderfully complex antlers of *Cervus Sedgwickii* of the forest bed, and *C. dicranios* of the Val d'Arno, and in the gigantic antlers of the pleistocene, and pre-historic Irish elk. It must, however, be pointed out that the *Cervus Matheronis* of the upper miocene, identified by Prof. Gaudry with the Axis, has no relation with that animal, as may be seen by the examination of the most perfect antlers yet discovered of the former animal, in the British Museum. A more rudimentary form of antler (*Procervulus*, Gaudry) even than the Muntjac has been discovered in the middle miocene strata of Thenay, without a burr, which was, like ordinary horns, persistent through the life of the animal.

We have merely touched upon some of the questions raised in this work, which occupies most important ground in the evolution controversy, and may be looked upon as one of the first fruits of the principles laid down by Mr. Darwin in the "Origin of Species."

W. BOYD DAWKINS

AMERICAN GEOLOGICAL SURVEYS

United States Geological Exploration of the Fortieth Parallel. By Clarence King, Geologist in Charge. Vol. II. *Descriptive Geology*, 1877. Vol. IV. *Ornithology and Palæontology*, 1877. (Washington: Government Printing Office, 1877.)

THE important survey of a portion of the north-western states of America, which was commenced by Clarence King and his able assistants in 1867, has now, after ten years of arduous labour, been brought to a close. In the original scheme drawn up for the publication of the results of this survey it was proposed that the observations of the surveyors should be published in five volumes, devoted to the following subjects:—

- I. Systematic Geology.
- II. Descriptive Geology.
- III. Mining Industry.
- IV. Zoology and Palæontology.
- V. Botany.

The third of these volumes was prepared and issued soon after the commencement of the survey. It abounds with valuable details concerning the rich ore deposits of the north-west and the methods by which they can best be worked. It is difficult to know which to admire most—the accuracy and beauty of illustration of this volume or the characteristic energy and promptitude with which it was produced in order to meet a pressing want.

In 1876 a supplementary volume numbered VI., not contemplated in the original scheme, was published; it deals with the subject of Microscopic Petrography, and is from the pen of Prof. Zirkel, of Leipzig. As this work has already been noticed in the pages of NATURE, we need do no more on the present occasion than refer to the circumstances under which it was published.

Two other volumes, those numbered II. and IV. are now before us, and amply sustain the high reputation which Mr. Clarence King and his indefatigable fellow-workers have acquired for energy and zeal in the prosecution of their important task, no less than for great geological knowledge and literary ability.

The volume on Descriptive Geology consists of a series

of chapters giving full and accurate accounts of the geological features of the Rocky Mountains, the Green River Basin, the Utah Basin, the Nevada Plateau, and the Nevada Basin respectively, the descriptions being from the pens of Arnold Hague and S. F. Emmons. The rocks exposed in this vast area include representatives of the whole series of geological formations from the Archæan to the Post-pliocene, together with many plutonic and volcanic masses belonging to various geological periods. The descriptions are of the most minute and careful character, and are interspersed with valuable analyses of the rocks described.

One of the most useful features of this volume is the series of twenty-six lithographic plates illustrating the grand and peculiar scenery of the district. These are admirable copies of photographs taken upon the spot, and they are probably, without exception, the most successful attempts to illustrate scenery in this manner that have ever been made. We would especially instance Plates V. and VI., illustrating the Tertiary bluffs near Green River City, Wyoming, and Plate XIV., showing the characters of the Wahsatch Limestone Cliffs, Provo Cañon, Wahsatch Range, as presenting the characteristic features of rock-masses in a manner which cannot fail to be appreciated by every geologist who has had opportunities for extensive observation in the field. Other plates, such as X., representing the Agassiz Amphitheatre in the Uinta Mountains, and XIX., in which a ridge of Archæan quartzite in the Humboldt Range is depicted, are wonderfully striking reproductions of the remarkable scenery of the district. In a series of plates illustrating the saline springs, we have the peculiar features of the great plains also presented to us in a very vivid manner.

Volume IV. consists of three parts. In the first of these a series of fossils from all the formations, from the Silurian to the Tertiary inclusive, are described by the late F. B. Meek. This part is illustrated by seventeen lithographic plates of great excellence. The second part is by James Hall and R. P. Whitfield, and describes certain new forms, from the Primordial to the Jurassic; it is illustrated by seven plates.

The third part of the volume is devoted to the description of the habits of the various species of birds met with during the several expeditions. It is from the pen of Mr. Robert Ridgway, the zoologist attached to the staff.

The United States Government is to be congratulated on having been able to secure such valuable illustrations of the natural history of their extensive and interesting territories as are contained in the splendid volumes before us, and the value of these contributions to science is greatly enhanced by the liberality with which they have been distributed among scientific workers and public libraries in every part of Europe. We shall look forward with much interest for the appearance of the other volumes of the series.

J. W. JUDD

OUR BOOK SHELF

Tent Work in Palestine. A Record of Discovery and Adventure. By Claude Regnier Conder, R.E., Officer in Command of the Survey Expedition. Two vols. (London: Bentley and Son, 1878.)

THIS is the first substantial result of the survey of Palestine, which has been going on for the last few years. It

is published by the Committee of the Palestine Exploration Fund, but is merely preliminary to the publication of the various detailed memoirs and the unprecedentedly minute map which are in preparation. It is mainly the narrative of Lieut. Conder's personal work and adventure, but besides its strong interest as a record of adventure in one of the most interesting countries in the world, it contains a vast amount of information and discussion concerning the many places so full of sacred associations to all Christian peoples. The work of the Survey was often pursued under considerable hardships, and occasionally at some risk, and more than one of the staff had to succumb during the progress of the work. It is evident that this most interesting of surveys has been executed with a minuteness and a care that leave little to be desired. The survey was actually commenced at the end of the year 1871. Capt. Stewart, the first officer in charge, had to come home on account of his health, and in July, 1872, Lieut. Conder took up the command, and completed four-fifths of the survey, the remaining fifth being carried out in 1877 by Lieut. Kitchener. The great map now extends over 6,000 square miles, from Dan to Beersheba, and from the Jordan to the Mediterranean Sea. This map is being prepared in twenty-six sheets; and an idea of its minuteness may be obtained from the fact that it will show tombs, caves, cisterns, wells, springs, rock-cut wine-presses, remarkable trees, and even the Roman milestones. Accompanying the map will be a memoir prepared by Lieut. Conder under the direction of Major Wilson and Mr. George Grove. It is hoped that all will be ready for publication in the course of a few months. This memoir will contain a vast collection of varied information gathered from many sources, and with the map will undoubtedly be of infinite service to students of the Biblical narratives. Lieut. Conder's work will amply repay careful study, and the many illustrations of places whose names are "familiar as household words," add greatly to its interest and value.

LETTERS TO THE EDITOR

- [The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]
- [The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

Discovery of Vulcan

A LETTER from the Astronomer-Royal, in *NATURE*, vol. xviii. p. 380, giving the exact position of θ Cancri on the day of the total solar eclipse, intimates that, as the position given by Prof. Watson of the intra-Mercurial planet discovered on that day agrees so closely with that star, it may have been the object discovered, I have thought it advisable to give the facts concerning it, in order to correct such an impression if it still exists. That he had a view of the planet as stated there is no doubt, for I myself saw it some four or five minutes later, using θ as a comparison star, and am able not only to corroborate the discovery, but to substantiate the position given by him. Its proximity to θ enabled me to estimate its position with great exactness, especially in declination. It may be well here to state that I was prevented from searching to the east of the sun, in consequence of forgetting to untie a string with which I had tied, to the eye end of the telescope, a long pole to prevent the wind from shaking it, the end resting on the ground not allowing the instrument to be moved to the eastward. It is undoubtedly to this circumstance, which at the time seemed untoward, that I owe the discovery of Vulcan. In my eagerness to discover this hypothetical planet I had decided to ignore nearly all of the phenomena attending the eclipse, and as, at the commencement of total phase, there was visible neither the chromosphere nor any protuberances—nothing, in fact, but the corona, I almost immediately began the sweeps for it; but my hampered telescope behaved badly, and no regularity in the sweeps could be main-

tained. Almost at once my eye caught two red stars about $3'$ south-west of the sun, with large, round, and equally bright discs, which I estimated as of the fifth magnitude, appearing (this was my thought at the time) about as bright in the telescope as the pole star does to the naked eye. I then carefully noted their distances from the sun and from each other, and the direction in which they pointed, &c., and recorded them in my memory, where, to my mind's eye, they are still distinctly visible. I then swept southward, not daring to venture far to the west for fear I should be unable to get back again, and soon came upon two stars resembling in every particular the former two I had found, and, sighting along the outside of the tube, was surprised to find I was viewing the same objects. Again I observed them with the utmost care, and then recommenced my sweeps in another direction, but I soon had them again, and for the third time in the field. This was also the last, as a small cloud hindered a final leave-taking just before the end of totality, as I had intended. I saw no other stars besides these two, not even δ , so close to the eastern limb of the sun. The distance between them was about $7'$ or $8'$.

By three careful estimates the two stars pointed exactly to the sun's centre. When it is considered that a deviation of not over $15''$, in two objects so close, will cause them to point considerably to one side of the centre of the sun—three degrees away—it may be assumed that its declination was quite correctly estimated. Thus far all seems clear and free from doubt, but it is just here where the trouble begins, for, unfortunately, I could not tell which was the star and which the planet. Happily Prof. Watson comes to the rescue, and with his means of measuring, says "the planet was nearest the sun."

The Astronomer-Royal gives the place of θ , on that day, as in R.A. 8h. 24m. 40s., Decl. $+18^{\circ}30'20''$. From this I deduce the position of the planet at 5h. 22m. Washington M.T. to have been in

R.A. 8h. 26m. 40s.

Decl. $+18^{\circ}30'25''$.

This is a close approximation to that given by Prof. Watson. It is to be hoped that a comparison will determine the position in its orbit, whether it was approaching superior conjunction, as Watson thinks, or, as appears most reasonable to me, had just passed its inferior conjunction.

LEWIS SWIFT

Rochester, N. Y. September 4

The Respiration of Plants

I DESIRE, with your permission, to give publicity in the columns of *NATURE* to the results of some observations on the above subject, communicated by me to the Royal Society of Victoria on June 13. As the facts to be mentioned are not referred to in Sachs' "Text-book of Botany," in the dictionaries of chemistry of Watts and Wurtz, or in recent volumes of the *Journal of the Chemical Society* or the *Chemisches Centralblatt*, I presume that they are little, if at all, known to botanists. I have found, first about nine years ago, and have more systematically observed lately, that fresh sections of many fruits, such as the apple and pear, and other vegetable structures as the potato, turnip, &c., give the reactions considered to be characteristic of ozone, viz., causing separation of iodine from iodide of potassium, and turning tincture of guaiacum blue, the intensity of these reactions varying in different samples of the vegetable substances, but depending mainly on their comparative freshness. I have further found that the same structures contain a substance which acts as an *Ozonträger*, to use Schönbein's expression, a substance which transfers ozone from peroxide of hydrogen and similar articles. This is shown by the fact that if the guaiacum is not blued at all, or only to a slight extent, the blue colour becomes very marked when a drop of ethereal solution of peroxide of hydrogen is added. I infer from these observations (1) that the oxygen inhaled by living plants, and even by pulled fruits for a time, is ozonised or rendered active, probably by entering into loose combination, as is the case with the oxygen in the blood of animals; and (2) that it is probable, though not proved, that the ozone-transferring substance existing in almost every fresh vegetable structure is that with which it is loosely combined, as the oxygen in the blood is with the hæmoglobin of the red corpuscles, which is a very active *Ozonträger*. This element in plants is gradually destroyed as decay comes on, and ceases to perform its